Before the

FEDERAL COMMUNICATIONS COMMISSION

Washington, D.C. 20554

In the Matter of	)	
	)	
Use of Spectrum Bands Above 24 GHz For Mobile Radio Services	)	GN Docket No. 14-177
	)	
Establishing a More Flexible Framework to Facilitate Satellite Operations in the 27.5-28.35 GHz and 37.5-40 GHz Bands	)	IB Docket No. 15-256
	)	
Petition for Rulemaking of the Fixed Wireless Communications Coalition to Create Service Rules for the 42-43.5 GHz Band	)	RM-11664
	)	
Amendment of Parts 1, 22, 24, 27, 74, 80, 90, 95, and 101 To Establish Uniform License Renewal, Discontinuance of Operation, and Geographic Partitioning and Spectrum Disaggregation Rules and Policies for Certain Wireless Radio Services	)	WT Docket No. 10-112
	)	
Allocation and Designation of Spectrum for Fixed-Satellite Services in the 37.5-38.5 GHz, 40.5-41.5 GHz and 48.2-50.2 GHz Frequency Bands; Allocation of Spectrum to Upgrade Fixed and Mobile Allocations in the 40.5-42.5 GHz Frequency Band; Allocation of Spectrum in the 46.9-47.0 GHz Frequency Band for Wireless Services; and Allocation of Spectrum in the 37.0- 38.0 GHz and 40.0-40.5 GHz for Government Operations	)	IB Docket No. 97-95

COMMENTS OF LOCKHEED MARTIN CORPORATION

Jennifer A. Warren
Vice President, Technology Policy & Regulation
Trade & Regulatory Affairs
Lockheed Martin Government Affairs
2121 Crystal Drive, Suite 100
Arlington, VA 22202

September 30, 2016

TABLE OF CONTENTS

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Use of Spectrum Bands Above 24 GHz For Mobile Radio Services	)	GN Docket No. 14-177
	)	
Establishing a More Flexible Framework to Facilitate Satellite Operations in the 27.5-28.35 GHz and 37.5-40 GHz Bands	)	IB Docket No. 15-256
	)	
Petition for Rulemaking of the Fixed Wireless Communications Coalition to Create Service Rules for the 42-43.5 GHz Band	)	RM-11664
	)	
Amendment of Parts 1, 22, 24, 27, 74, 80, 90, 95, and 101 To Establish Uniform License Renewal, Discontinuance of Operation, and Geographic Partitioning and Spectrum Disaggregation Rules and Policies for Certain Wireless Radio Services	)	WT Docket No. 10-112
	)	
Allocation and Designation of Spectrum for Fixed-Satellite Services in the 37.5-38.5 GHz, 40.5-41.5 GHz and 48.2-50.2 GHz Frequency Bands; Allocation of Spectrum to Upgrade Fixed and Mobile Allocations in the 40.5-42.5 GHz Frequency Band; Allocation of Spectrum in the 46.9-47.0 GHz Frequency Band for Wireless Services; and Allocation of Spectrum in the 37.0- 38.0 GHz and 40.0-40.5 GHz for Government Operations	)	IB Docket No. 97-95

COMMENTS OF LOCKHEED MARTIN CORPORATION

Lockheed Martin Corporation ("Lockheed Martin") hereby submits these comments in response to the Commission's Further Notice of Proposed Rulemaking in the above-captioned proceeding.[1]

[1] *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services*, GN Docket No. 14-177, et al., Report and Order and Further Notice of Proposed Rulemaking, FCC 16-89 (July 14, 2016) ("*Further Notice*").

I. INTRODUCTION AND SUMMARY

Lockheed Martin welcomes the opportunity to provide comments in this *Further Notice*, which has the potential to significantly impact the availability of spectrum for innovation and the emergence of advanced technology platforms for commercial, public safety or homeland security applications.

Lockheed Martin is a manufacturer of, and provider of commercial launch services to, satellite systems operating or planning to operate around the world in a variety of services and frequency ranges – including the fixed-satellite service ("FSS") frequency bands in the Q/V-band range at 37.5-40 GHz and 47.2-50.2 GHz that are among the subjects of Commission proposals in the *Further Notice*. It is also a developer and manufacturer of a wide range of advanced systems, payloads, and platforms that operate or are planned for operation at various altitudes and at various high frequency bands, including those that are the subject of this *Further Notice*.

Lockheed Martin has a long history of successful development and delivery of lighter than air vehicles. For example, it has developed high altitude airships and tethered aerostats that carry communications and other high-performing payloads, capable of serving military, civil (including state and local) and commercial markets. Its hybrid airships enable access virtually anywhere in a wide range of weather conditions, without requiring forward infrastructure or manpower.[2]

[2] In November 2015, Lockheed Martin received FAA approval of its specific project certification plan, enabling it to safely operate in a commercial capacity. In fact, Lockheed Martin just recently announced that the first commercial deployment of its cargo airship is scheduled for 2019.

Lockheed Martin is also a member of the Satellite Industry Association ("SIA"), and fully supports the SIA comments filed in the above-captioned proceedings today in response to the *Further Notice*.[3]

Lockheed Martin submits these comments to address several aspects of the F*urther Notice* that have significance to the Corporation. In particular, many of the bands addressed in the *Further Notice* support globally harmonized satellite service bands as well as frequency bands that should be available to serve as near-term future growth bands. As the Commission is well aware, the U.S. satellite industry has invested years of technical development and billions of dollars to provide affordable, reliable, high-capacity broadband and Internet connectivity. Similarly, U.S. manufacturers invest significantly in advanced research and development, and technology refreshes, to enable the use of higher and higher frequency bands commercially. Today, Lockheed Martin responds globally to customers' requests for proposals (RFPs) that contain Q/V band payloads – the Commission has the opportunity to foster spectrum policies that support national policies to advance U.S.-based satellite manufacturing and exports.

Lockheed Martin fully supports the satellite industry's emphasis on the importance of maintaining meaningful and flexible access to the frequency bands in this *Further Notice*, particularly the 37/39/42/50 GHz bands, given that they represent substantial existing allocations for FSS. The Commission's rules should seek to maximize the spectrum available for satellite systems, both FCC and non-FCC licensed, as well as any other emerging technologies that can demonstrate the ability to co-exist with reasonable sharing arrangements. With respect to the 71-76 and 81-86 GHz Bands, Lockheed Martin believes that these frequency bands should not be constrained at this time by additional regulations; instead the Commission should adopt a truly

[3] *See* Comments of the Satellite Industry Association, GN Docket No. 14-177, *et seq*. (filed Sep. 30, 2016).

flexible approach that allows all emerging technologies the opportunity to flourish in these bands. Further action should be considered in a broader, separate proceeding that addresses more than the traditional wireless mobile services, by including more innovative technologies.

In addition, Lockheed Martin addresses the impact of the Commission's proposals on the prospects for the emergence of airborne platforms which have great promise to serve commercial and civil needs, including critical infrastructure and public safety markets, using the Q/V-band frequency range, and urges the Commission to avoid actions that constrain the development of these frequency bands for such use. Lockheed Martin notes, for example, that High Altitude Platform Stations ("HAPS") use of certain frequency bands proposed for mobile broadband use in the *Further Notice* is now under study – at the instigation of the United States – in the International Telecommunication Union ("ITU") for potential action at the 2019 ITU World Radiocommunication Conference ("WRC-19"). Lockheed Martin urges the Commission to avoid pre-empting the valuable ITU studies just underway pursuant to the WRC-19 agenda; these studies extend to sharing and compatibility with the mobile, fixed, and satellite services. In the Q/V-band, all technologies capable of providing broadband, public safety or emergency response services are currently "emerging" technologies, and meritorious of Commission flexibility, rather than the Commission focusing its regulatory actions on one technology at the expense of all others. The Commission must not sacrifice individual broadband-capable technologies for the advancement of the equally or even more nascent Q/V-band terrestrial mobile technology, particularly after having just introduced vast flexibility in several gigahertz of 28, 37, and 39 GHz bands. Instead, the Commission should lean forward and embrace true flexibility for enabling new operational capabilities in a way that allows for innovation beyond terrestrial mobile wireless.

II. DISCUSSION

The ongoing ITU discussions regarding one category of airborne technology, HAPS, in the V-band frequencies began nearly 20 years ago. As the Commission may recall, the United States, at the behest of a private company, proposed the identification of spectrum in the V-band range for use by HAPS to the 1997 WRC ("WRC-97"). WRC-97 identified two 300 MHz segments of fixed service ("FS") spectrum, the V-band – 47.2-47.5 GHz and 47.9-48.2 GHz, for use by HAPS.[4] Although the initial commercial HAPS ventures were well ahead of their time, interest in the commercialization of this and other airborne technologies continued to percolate over the years. Subsequent WRCs adopted additional modest identifications in the FS for HAPS in parts of the world.[5] The ITU also explored the possibility of HAPS in mobile broadband spectrum, and several mobile service ("MS") bands around the world in the 2 GHz frequency range were identified for HAPS as base stations for mobile broadband (or "IMT") systems.[6] In sum, these actions may be seen as tentative first steps toward accommodating a segment of the broader innovations occurring in airborne platform technology capabilities; it is necessary to realize that the location and amounts of spectrum may be quite inadequate for the pairing of the capabilities of current and emerging technologies to meet the needs that could be addressed by them.

---

[4] *See* No. 5.552A of the ITU Radio Regulations, which provides in pertinent part that "the allocation to the fixed service in the bands 47.2-47.5 GHz and 47.9-48.2 GHz is designated for use by high altitude platform stations." WRC-97 also adopted a definition for high altitude platform stations as those operating at or above 20 km up to 50 km.

[5] In various parts of the world, there are HAPS identifications, some directional, in the 6440-6520 MHz, 6560-6640 MHz, 27.9-28.2 GHz, and 31-31.3 GHz FS bands.

[6] *See* No. 5.338A of the ITU Radio Regulations, which identifies the bands 1885-1980 MHz and 2110-2160 MHz in Region 2 (the Americas), and the bands 1885-1980 MHz, 2010-2025 MHz and 2110-2170 MHz in Regions 1 and 3 (Europe/Africa and Asia, respectively) for HAPS as IMT base stations.

In the run up to WRC-15, interest in airborne technology for the provision of broadband service was resurgent. Several prominent companies in the United States sought a future WRC agenda item to explore the possibility of new and revised identifications for HAPS technology in FS bands, and helped secure a WRC proposal from the United States and other Region 2 countries that led to a HAPS item on WRC-19 agenda and the adoption of an associated study resolution.[7] Under this WRC-19 agenda item – Agenda Item 1.14 – WRC-19 will consider, on the basis of ITU-R studies in accordance with Resolution 160 (WRC-15), appropriate regulatory actions for HAPS within existing fixed-service allocations.

Resolution 160 reflects the consideration of WRC-15 that, among other things, there is a need for greater broadband connectivity and telecommunications services in underserved areas, and that HAPS technology is one way of providing that connectivity.[8] The resolution also reflects the WRC's recognition that since 2012, there have been evolutions in technology through advances in solar panel efficiency, battery energy density, lightweight composite materials, autonomous avionics and antenna technology that, together, are directly relevant to high altitude airships, including HAPS.[9] The resolution goes on to direct the ITU's Radiocommunication Sector (the "ITU-R") to conduct studies of how the existing HAPS identifications in the FS (including those in the 47.2-47.5 GHz and 47.9-48.2 GHz bands, along with those in the Ka-band and C-band ranges) can be used for broadband connectivity, and to look to modifying or eliminating regulatory conditions that apply to some of the currently-

[7] The associated resolution is Resolution 160 (WRC-15), entitled "Facilitating access to broadband applications by high-altitude platform stations."

[8] Resolution 160 (WRC-15), at *considerings* a) and c).

[9] *Id.*, at *recognizing* g).

identified bands.[10] The resolution calls for an examination of spectrum needs for broadband HAPS in the FS, and specifies that if the needs cannot be met in the existing FS identifications for HAPS, possible new HAPS identifications should be considered by WRC-19 in the fixed service bands including at 21.4-22 GHz and 24.25- 27.5 GHz in Region 2 (which includes the United States), and 38-39.5 GHz globally.[11] Importantly, all of the studies are to include sharing and compatibility studies, which include services such as satellite, mobile, and/or fixed (and others).[12]

The ITU-R studies called for in Resolution 160 are getting underway in the responsible Working Parties, and the United States (represented by interested parties from the HAPS, satellite, Federal user, and other communities) is actively involved. Preparations for WRC-19 are underway here at home as well. Informal Working Group 2 of the Commission's WRC-19 Advisory Committee ("WAC") just adopted a preliminary view on the studies under Resolution 160 and WRC-19 Agenda Item 1.14 that specifies in pertinent part that "the United States supports studies, in accordance with Resolution 160 (WRC-15), and appropriate WRC-19 action based on the results of these studies, including possible modifications to the existing provisions on HAPS identifications in the Radio Regulations and possible new HAPS identifications in the fixed service bands at 21.4-22 GHz and 24.25- 27.5 GHz in Region 2, and 38-39.5 GHz globally."[13] Lockheed Martin expects this consensus view to be recommended by the WAC for Commission adoption.

---

[10] *Id.,* at *resolves to invite ITU-R* 1-3.

[11] *Id.,* at *resolves to invite ITU-R* 4.

[12] *Id.,* at *further resolves* 1.

[13] Document IWG-2-11 (rev. 1), as adopted by IWG-2 on September 20, 2016.

Clearly, worldwide interest in the use of airborne platforms, including HAPS technology as one notable example, is resurging. Indeed, high altitude airborne platforms that do not fall within the definition of HAPS should also be, and are being, explored. Therefore, Lockheed Martin urges the Commission to ensure that action taken in response to the *Further Notice* does not in effect constrain the ITU studies underway nor itself fail to take into account the broader range of airborne technologies.

In the Report and Order portion of the *Further Notice,* the Commission made a number of policy choices and took a number of actions that advance mobile broadband use of the 27.5-28.35 GHz ("28 GHz") and 37.5-40 GHz ("37/39 GHz") bands while making FSS use of the same bands by other services much more difficult. Despite the Satellite Industry Association's sustained push for a more balanced approach to sharing and compatibility in both band segments, its technical viability concerns received minimal response. Lockheed Martin also directly raised the need to be able to effectively respond to international treaty obligations into the record of the proceeding – namely the impact of aggregate mobile emissions in the 28 GHz band on non-U.S.-licensed satellites serving neighboring countries; to date, the Commission has not identified a framework for addressing this considerable risk.[14]

Although the Commission's actions on the 28 GHz band and especially the 37/39 GHz band will be among the many matters addressed on reconsideration and application of the Report and Order in the years ahead, Lockheed Martin raises these actions to encourage the Commission to avoid a pattern of action – a pattern with potentially serious international ramifications.

Under Agenda Item 1.13 for WRC-2019, the ITU-R is studying and will consider identification of frequency bands for the future development of IMT, including possible

[14] *Further Notice*, at 25-26 n.135.

additional allocations to the mobile service on a primary basis, in accordance with Resolution 238 (WRC-15). Resolution 238 contains a list of specific bands to be studied for potential worldwide mobile broadband use during the ITU-R study cycle just getting underway. The list includes the 37/39 GHz band frequencies made available for mobile broadband use in the Report and Order portion of the *Further Notice*, several additional bands already allocated and used or planned for use by satellite services (including bands that are the subject of separate WRC-19 agenda items considering intra-FSS sharing issues and sharing issues associated with introducing mobility applications into the FSS in some bands), several bands under study for possible HAPS identifications and regulatory improvements in accordance with WRC-19 Agenda Item 1.14 and Resolution 160, and a number of the bands that are the subject of active proposals for mobile broadband use in the Further Notice of Proposed Rulemaking portion of the *Further Notice*.[15]

The Commission's decision to make the 37/39 GHz band available for mobile broadband use in the United States contains only passing references to the international study just underway for WRC-19 under Agenda Item 1.13 and Resolution 238, and does not address at all the potentially prejudicial impact its action may have on those early studies in the ITU-R.[16]

---

[15] *See* Resolution 238 (WRC-15), at *resolves to invite ITU-R* 2, calling for the ITU-R "to conduct and complete in time for WRC-19 the appropriate sharing and compatibility studies, taking into account the protection of services to which the band is allocated on a primary basis, for the frequency bands:

– 24.25-27.5 GHz, 37-40.5 GHz, 42.5-43.5 GHz, 45.5-47 GHz, 47.2-50.2 GHz, 50.4-52.6 GHz, 66-76 GHz and 81-86 GHz, which have allocations to the mobile service on a primary basis; and

– 31.8-33.4 GHz, 40.5-42.5 GHz and 47-47.2 GHz, which may require additional allocations to the mobile service on a primary basis . . ."
(footnotes omitted).

[16] The 28 GHz band situation is a separate case. At WRC-15, the United States, led by the Commission, was unsuccessful in its attempt to include the 27.5-28.35 GHz band onto the list of bands in what became Resolution 238. Other countries from around the world excluded that band because of the incompatibility of mobile broadband wireless with FSS use. The Commission's decision to proceed unilaterally with the commitment of this band to IMT-like use, because "there are significant benefits to authorizing mobile use in the 28 GHz band regardless of that international decision" (*Further Notice*, at 13 ¶ 25), has emboldened other countries that harbor similar aspirations

The Commission similarly makes no substantive mention of the impact its proposed actions in the 24 GHz, 42 GHz, 47 GHz and 50 GHz bands will have on the ITU-R studies under Agenda Item 1.13 and Resolution 238, nor does it address in any way the recognized issue of an overlap between agenda items on mobile broadband and other agenda items for satellite services and HAPS in the FS.[17] Finally, the Commission does not speak in terms of protecting existing services; it talks instead of "sharing," where existing services, broadband capabilities, and flexibility to accommodate new technologies and delivery methods that may better share with existing users are all sacrificed to promote accommodation of "flexible" mobile broadband use.[18]

The Commission's unilateral action on 37/39 GHz, and its advancement of proposals to do much the same in a number of other bands involved in open ITU-R studies, runs the risk of undercutting the credibility of U.S. participation in the ITU-R studies under Agenda Item 1.13, not to mention in future WRCs. Participants in the ITU-R from both the United States and elsewhere have no evidence that the United States will actually protect existing services as all of the study resolutions require, and, given decision-making prior to advancements in the ITU

for either IMT, FSS, or other uses or standards, and undercuts both the international WRC process and the Agenda Item 1.13 studies in a potentially paradigm-altering way. As awkward as the 28 GHz band situation is, the situation at 39 GHz and other bands in the *Further Notice* is arguably worse, as these bands *are* specified for study in Resolution 238.

[17] Lockheed Martin notes that this overlap issue is one the Commission and the rest of the U.S. delegation to WRC-15 had in the forefront of their minds as the agenda was developed for WRC-19. Ultimately, the only possible way forward at WRC-15 was to defer resolution of the overlap issues until the studies – which were to take these factors into account – had an opportunity to progress. Despite the fact that the HAPS agenda item was a U.S. initiative at WRC-15, the Report and Order paving the way for mobile broadband in some of the same 39 GHz frequencies that will be studied under Agenda Item 1.14 and Resolution 160 makes no mention of the possibility of HAPS or even more generically airborne uses in the 38-39.5 GHz portion of the 39 GHz band.

[18] *See, e.g., Further Notice*, at 136, ¶ 384.

studies, they also have no confidence that the United States considers the outcome of the studies – no matter what they may yield – relevant.[19]

Lockheed Martin urges the Commission, as it proceeds with the *Further Notice*, to take affirmative actions that may remove constraints on the U.S.-initiated studies on either sharing with the FSS or on the facilitation of new technologies in the 47 GHz and 24 GHz band frequencies that are the subject of current proposals. Lockheed Martin does not know how the various sharing and compatibility studies required for HAPS (both in the existing identifications and in the additional bands specified for study) will turn out, but it is optimistic that compatibility and sharing conditions can be achieved if the studies are allowed to in fact proceed based on technical contributions. Second, the Commission should avoid taking steps in the above-captioned proceedings that constrain in any way the conducting of objective ITU-R studies on sharing and compatibility of mobile broadband and satellite services in the FSS bands specified in Resolution 238. If the United States places any importance on the technical credibility of the ITU-R process, Lockheed Martin urges the Commission to support the U.S. and the U.S. satellite industry's being able to provide technical characteristics, parameters, and protection criteria for use in studies under Agenda Item 1.13 and Resolution 238. As the Commission knows, such an approach in no way constrains its ability to consider whether

[19] This is a reasonable concern. For example, in U.S. preparations for the meeting of ITU-R Working Party 4A that commenced on September 28, 2016, mobile service representatives attempted to prevent FSS operators from proposing to forward to the ITU-R group conducting the studies under Agenda Item 1.13 a long-standing FSS protection criterion that the mobile representatives felt would lead to undesirable sharing conditions or even to a finding of non-compatibility in particular bands. The FCC staff sided with the mobile industry, against protecting the FSS operations. Ultimately, the United States decided to submit characteristics and protection criteria papers regarding U.S. satellite systems that contained "TBDs" for table entries on protection criteria. While it remains to be seen how this effort will play out in ITU-R Working Party 4A (which has responsibility for FSS matters in the ITU), there is no question that it is increasingly difficult to reconcile FCC ITU positions with the *Further Notice* proposal to seek "sharing solutions".

domestic public interest considerations mandate a spectrum policy decision different from the ITU technical study results that it sought.

Although the Commission will likely point to the *Further Notice* and emphasize that it has recognized that there are challenges to be overcome before mobile service can be authorized – including existing allocations and/or operations in the spotlighted bands – and that it has committed to working with stakeholders "to determine where different services can coexist and develop ways to maximize flexible use,"[20] it is unclear what the process will be to implement these statements. The *Further Notice* proposes to make 17.7 GHz of additional spectrum available for future mobile broadband offerings, however, the scope of the term "flexible" appears to narrowly refer only to operators seeking to combine mobile and fixed uses to the exclusion of other potential operators, as well as other existing services to the extent possible.[21] Lockheed Martin is concerned that this sweeping action in nearly 18 GHz of spectrum, essentially eliminates any existing or planned user of other services in the subject bands, by being either relegated to either to some second-class status or be removed altogether.

Lockheed Martin does not dispute that the promotion and facilitation of broadband capabilities is an important national priority. The fact of the matter is that with the *Further Notice* proposals, particularly in emerging spectrum territory such as that found in all of the bands in the *Further Notice*, the Commission appears to be foreclosing on innovation in other technologies – space or airborne – that do or could advance that national priority. While it is clearly easier to look to a 5th generation of wireless technology, Lockheed Martin encourages the Commission to look beyond – to innovations that may still be at truly emerging stages.

[20] *Further Notice*, FCC 16-89, at ¶ 374.

[21] *Id.*, at ¶ 369.

Lockheed Martin encourages the Commission to rethink its current preference for rigid measures designed to advance the competitive interests of terrestrial mobile broadband, and re-center its focus on a broader public interest – which, in this area, requires flexible and adjustable arrangements that maximize both the efficient use of the spectrum and the prospects that those technologies prepared to adapt and innovate will be the ones that the markets may consider. Broadband delivery by airborne platforms and its satellites, for example, in the bands proposed for "mobilization" is on the threshold, and both provider types have earned the opportunity to cross over. The Commission must not close the door to them by adopting rules and policies that serve only the terrestrial mobile broadband service concept.

Operators in established industry sectors with decades-long records of innovation, and prospective providers of broadband via newly reenergized platforms that are becoming capable with technological innovations of fulfilling promises long delayed, all deserve better than what seems to be a seemingly inevitable assimilation of the satellite allocations into mobile use. The ITU-R studies ordered by WRC-15 – studies the United States helped promote and delineate over many difficult weeks and months just last year – must be able to move forward despite the high-profile actions the Commission has taken and/or proposed.

III. CONCLUSION

In Q/V-band, all technologies targeted for broadband delivery are currently nascent technologies. As it continues its evaluation of these bands, Lockheed Martin encourages the Commission to look beyond mobile wireless, to examine innovations in emerging broadband technologies – such as FSS HTS and airborne platforms, technologies in which the U.S. manufacturing industry can and does lead today, but whose market opportunities, exports, and

high-tech jobs can be harmed by U.S. policy decisions that constrains its development in favor of another single technology, such as mobile wireless.

Respectfully submitted,

LOCKHEED MARTIN CORPORATION

By: *Jennifer A. Warren*

Jennifer A. Warren
Vice President, Technology Policy & Regulation
Trade & Regulatory Affairs
Lockheed Martin Government Affairs
2121 Crystal Drive, Suite 100
Arlington, VA 22202

September 30, 2016